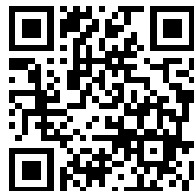




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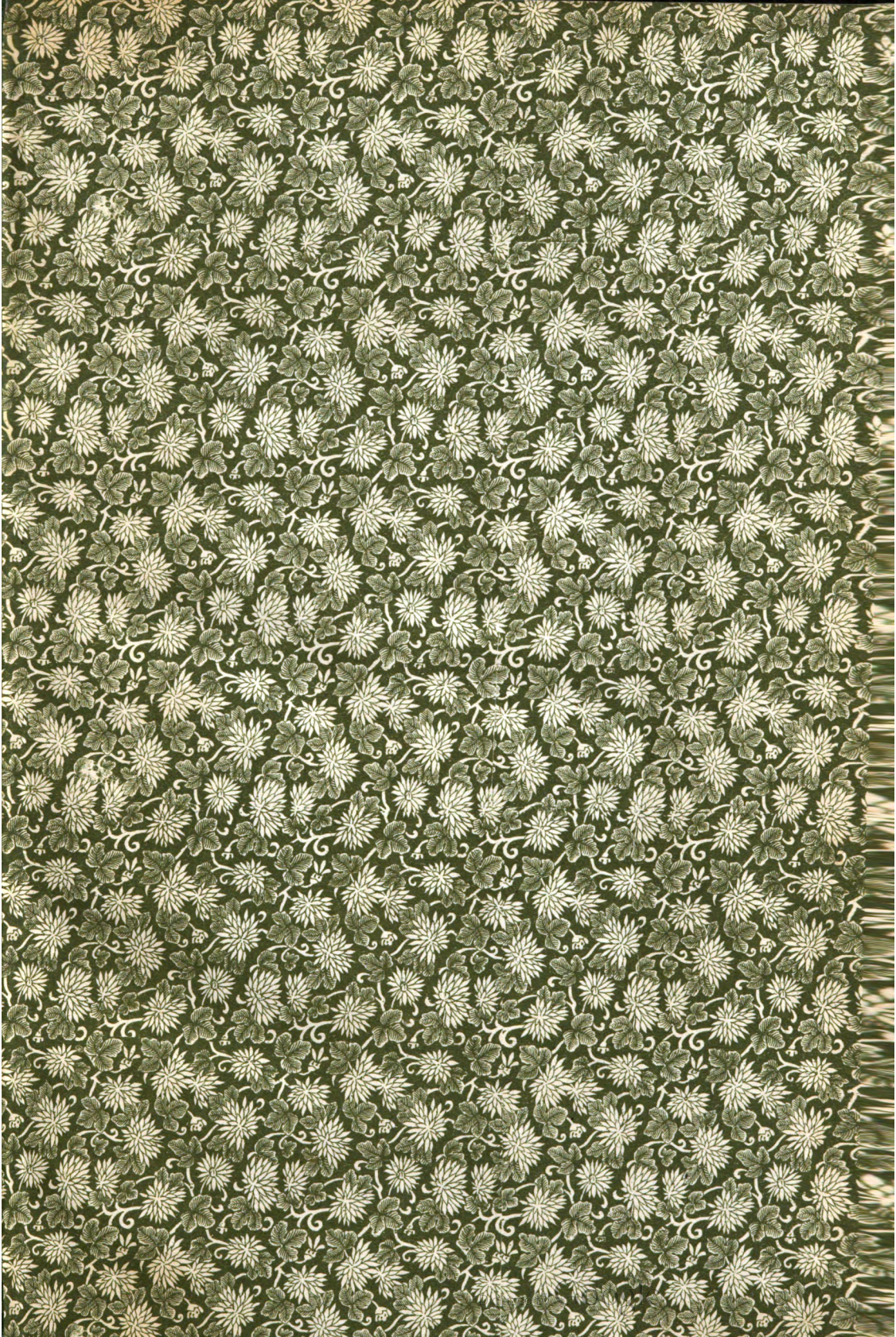
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SCI-TECH COLLECTION

February, 1968



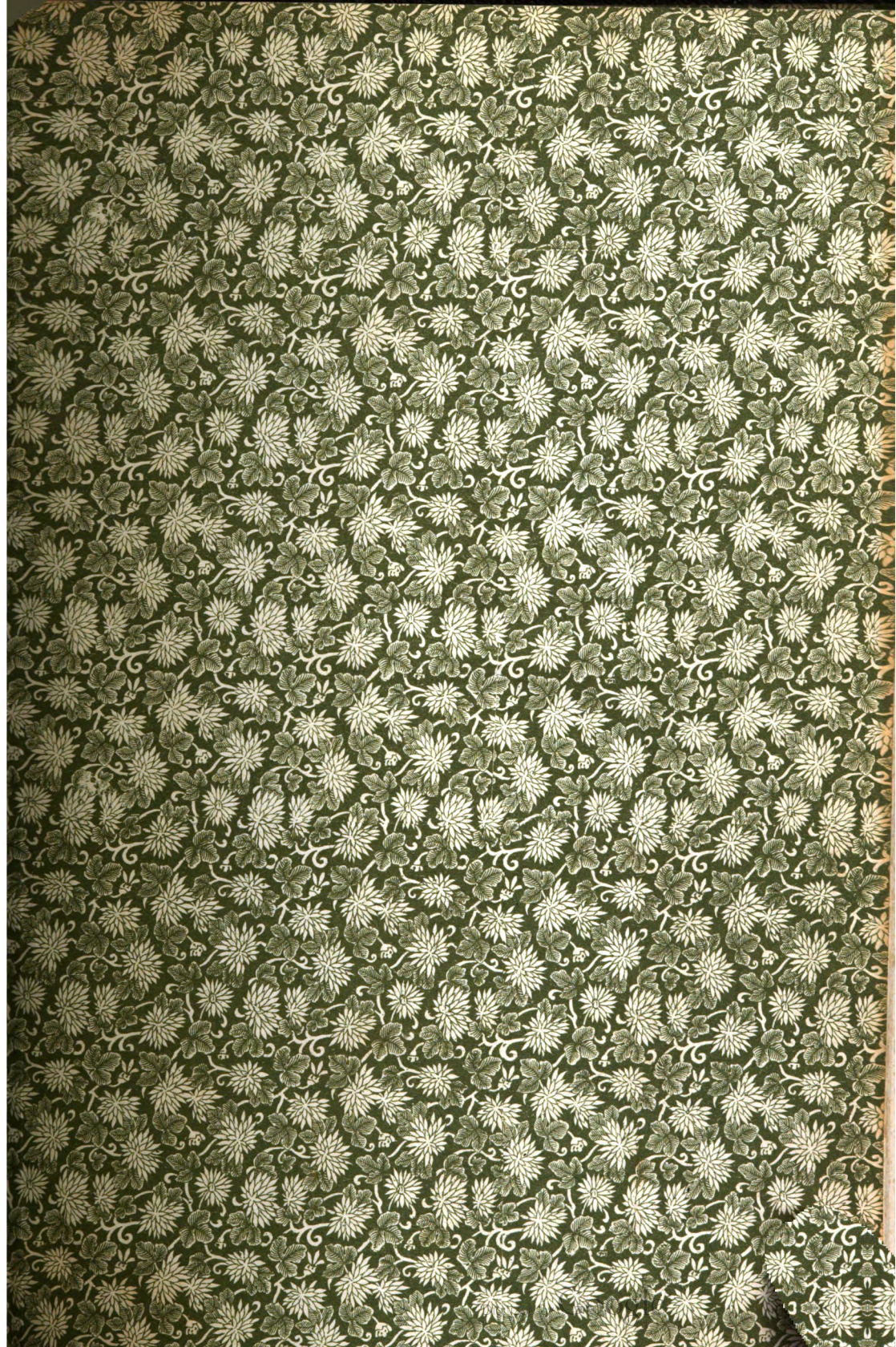


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SCI-TECH COLLECTION

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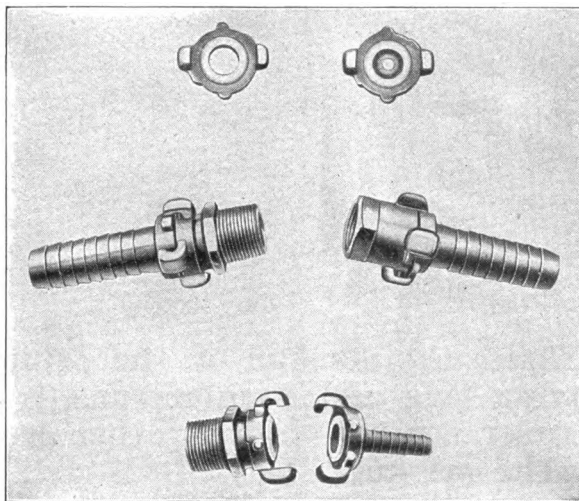
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Fire Hose
Reels, Nozzles
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G. S. WOOD, 209 Great Northern Bldg., Chicago, Ill.

The Chicago Hose Coupler



Is the only universal coupler yet devised.

Each half is the same in style and size whether for $\frac{1}{4}$ inch or inch hose, therefore couple anywhere.

Fully described in Special Circular No. 53.

Manufactured by

CHICAGO PNEUMATIC TOOL CO.

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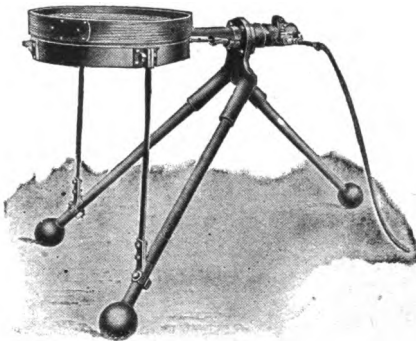
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Simple—Durable—Reliable and Fully Guaranteed



"Keller" and
"Chicago"
Sand
Rammers

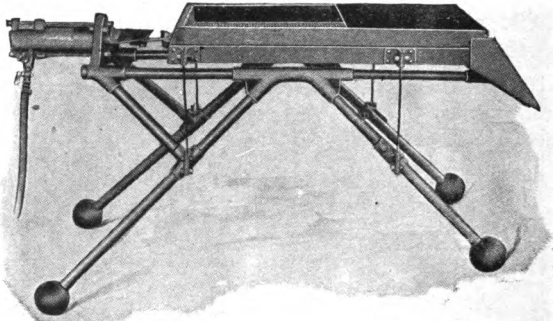


Chicago Tripod Sand Sifter No.



"Boyer" "Keller" and Improved
"D" Clipping HAMMERS. One
hammer will do the work of from
5 to 8 men.

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"Keller"
SAND
RAMMERS
are used by all
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are fitted with
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and hardened
bushings to protect them
against wear.



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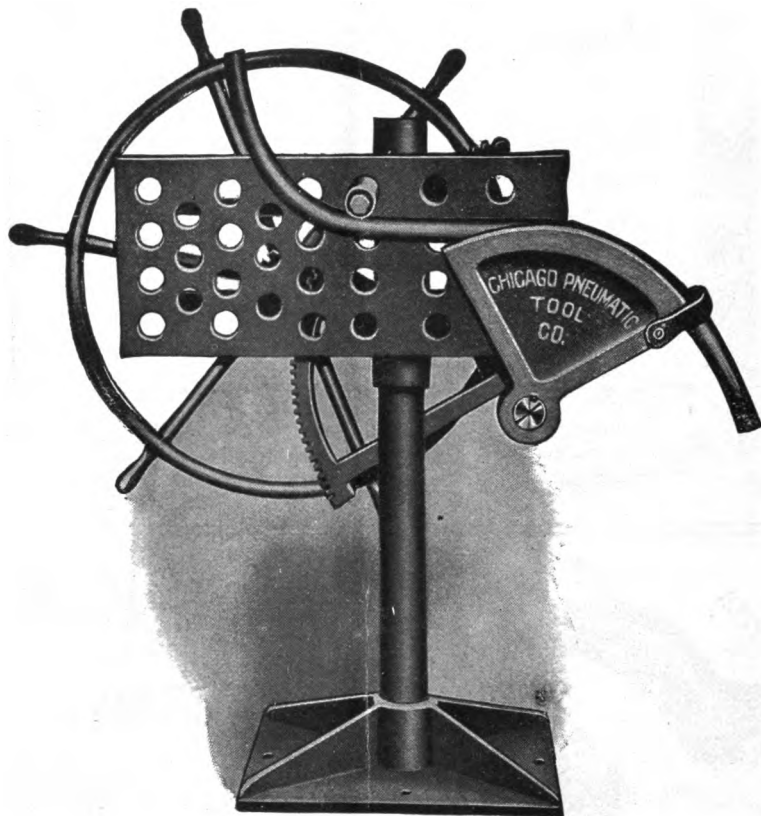
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Branch Offices Everywhere

CHICAGO—NEW YORK

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THE CHICAGO PIPE BENDING MACHINE



Should be installed in every roundhouse and locomotive repair shop. A valuable device for bending Steam Pipes, Branch Pipes, Etc.

Let us send you one on trial.

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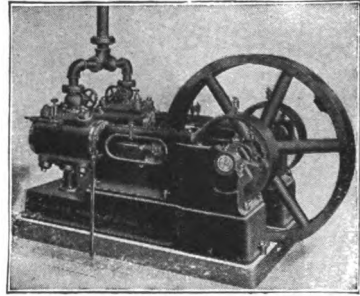
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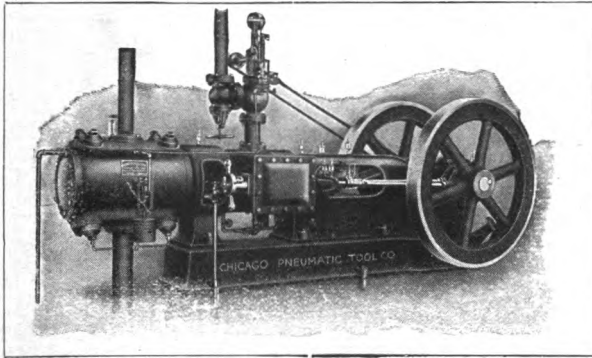
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FRANKLIN AIR COMPRESSORS



DUPLEX BELT FRANKLIN
AIR COMPRESSOR



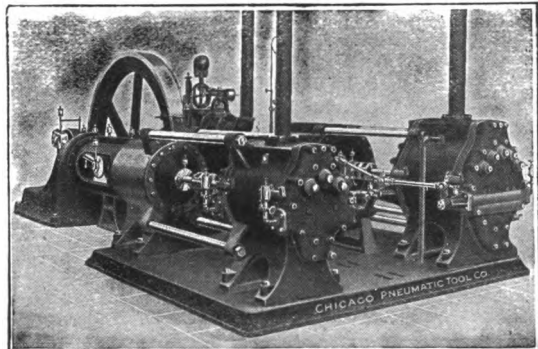
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are made in over
100 styles and
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They are strong,
durable, efficient
and carry our
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Every user of compressed air should have copy of our **NEW COMPRESSOR CATALOG No. 20** now ready for distribution.

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FRANKLIN AIR COMPRESSOR, TYPE C. S. C.
Having Compound Steam Cylinders and two Stage Air
Cylinders with Mechanically Operated Inlet Valves.
Separate Intercooler not shown.

CHICAGO PNEUMATIC TOOL CO.

CHICAGO

NEW YORK

Manufacturers Pneumatic Tools and Appliances, Air Compressors, Electric Drills, Etc.

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Car Foremen's Association of Chicago—President, O. M. Stimson, Swift Refrig. Line, Chicago, Ill.; Secretary, Aaron Kline, 326 N. 50th Court, Chicago, Ill. Regular meetings second Wednesday in each month at 8 p. m., Room 2.

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International Union of Steam Engineers—President, Matt Comerford, 595 East Seventh St., Brooklyn, N. Y.; Secretary, Robert A. McKee, 606 Main St., Peoria, Ill.

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Buffalo, N. Y.; Secretary, W. O. Thompson, R. W. & O. R. R., Oswego, N. Y.
 Western Society of Engineers—President, B. J. Arnold, Chicago, Ill.; Secretary, J. H. Warder, Monadnock Block, Chicago, Ill. Regular meetings first Wednesday; extra meetings generally third Wednesday each month except July and August.

DEFINITIONS OF "HOME."

The golden setting in which the brightest jewel is "mother."

* * *

A world of strife shut out, a world of love shut in.

* * *

An arbor which shades when the sunshine of prosperity becomes too dazzling; a harbor where the human bark finds shelter in the time of adversity.

* * *

Home is the blossom of which heaven is the fruit.

* * *

Home is a person's estate obtained without injustice, kept without disquietude; a place where time is spent without repentance, and which is ruled by justice, mercy and love.

* * *

A hive in which, like the industrious bee, youth garners the sweets and memories of life for age to meditate and feed upon.

* * *

The best place for a married man after business hours.

* * *

Home is the coziest, kindest, sweetest place in all the world, the scene of our purest earthly joys and deepest sorrows.

* * *

The place where the great are sometimes small, and the small often great.

* * *

The father's kingdom, the children's paradise, the mother's world.

* * *

The jewel casket containing the most precious of all jewels—domestic happiness.

* * *

Where you are treated best and grumble most.

* * *

The center of our affections, around which our heart's best wishes twine.

A popular but paradoxical institution, in which woman works in the absence of man, and man rests in the presence of woman.

* * *

A working model of heaven, with real angels in the form of mothers and wives.

* * *

Having offered a prize for the best definition of "Home," London *Tit-Bits* recently received more than five thousand answers.

Among those which were adjudged the best were the definitions which are printed above.

HOW TO LIVE LONG.

Those gentle folk who knew it all,

They tell me that if I

Would follow their directions I

Would seldom ever die.

Leastwise I've figured out the years

Their plans would me allow,

And if I'd followed of the same

I'd be two hundred now.

If I'd quit drinking coffee 'twould

Add ten years to my life;

Quit smoking, and I'd gain ten more

(These things they tell my wife).

And exercise, which I detest,

"Would make me young again."

(I think of youthful follies, though

And carefully abstain.)

They say that sitting up at night

Till one or two o'clock

Is undermining of my health

(It gives them chance to "knock").

They say I should "get up at six,"

At ten o'clock retire.

I think that any man who does

Is a blamed fool—or liar.

But, anyway, suppose I should

Do everything they say.

Life would not have a single charm.

Lived in that somber way.

A hundred years or so like that—

The prospect's full of dread—

I'd rather have a better time

And be the sooner dead.

—Globe Democrat.

IDEAL POWER

PUBLISHED MONTHLY
In the Interest of Compressed Air
and Electrical Appliances

BY THE

IDEAL POWER PUBLISHING CO.
1508 Fisher Building
CHICAGO, V. S. A.

G. A. REES,

Editor

December, 1906.

Vol. 3. No. 9.

TERMS OF SUBSCRIPTION

United States, Canada and Mexico, 25 cents per year
Other Countries in Postal Union, 50 cents per year

ADVERTISING RATES ON APPLICATION

Send 25 cents and have your name put on our
subscription list.

DEFICIT IN POSTAL DEPARTMENT.

Proposed Increase of 400 Per Cent in Second-Class Postal Rate.

Present rate, 1 cent per pound.

Proposed rate, 4 cents per pound.

This question is of vital importance to the public and from what we have noted seems to have received scarcely a single thought. To IDEAL POWER it means nothing from a selfish standpoint, hence we speak without personal motives.

CAUSE OF AGITATION.

Owing to the continued annual deficit in the postal department, requiring a special appropriation to cover same, the idea has become prevalent that the deficit is caused by the low second-class rates now charged for handling newspapers and periodicals. It is quite an easy matter to have one's imagination harness up an idea only to have it run away with him with the bit in its teeth. Therefore, IDEAL POWER should be pleased to have its 15,000 readers consider the subject and if they can conscientiously agree with us, immediately, write their respective congressmen at Washington, asking that other means be resorted to than that which we understand is contemplated.

This subject is to come up within the next few weeks and anyone interested should act promptly. 'Tis better to have the deficit than to avoid it by the remedy proposed, which will work a hardship upon the public at large, by causing a condition

which will necessitate the increasing of subscription rates of newspapers and periodicals. The newspapers claim (and the true conditions warrant it) that they are entitled to a lower rate than periodicals, for the reason the average haul in their case is approximately 300 miles, and on periodicals 800 miles; yet all publications of an educational nature are in our opinion entitled to the same rate without discrimination. There are a number of our leading publications with large circulations which the increase would force to expend from \$20,000 to \$40,000 annually in excess of their present outlay; the publishers could not be expected to bear the burden, hence the public would be forced to shoulder it through increasing advertising and subscription rates.

THE REAL CAUSE OF THE DEFICIT.

Every patriotic citizen desires that governmental affairs be managed along a strictly economical commercial basis, that a deficit might be eliminated from all departments, but in correcting such irregularities the prime cause should receive first attention, and in all probability there would be no necessity for touching upon secondary causes therefor, and the remedy we have in mind is simple and ought to be reasonably effective.

The *Franking Privilege* in our opinion is the worst evil which has permeated our postal laws, the repealing of which would give quick and permanent relief without in any way retarding the education of our people, or our commercial progress, while on the other hand the curtailment in circulation of our engineering and industrial publications would hamper our engineering and commercial students, which would prove nothing less than a commercial calamity.

We have no desire to suggest anything to our 15,000 readers that will inconvenience our congressmen, senators or other public officials, or cause them to suffer any pecuniary losses through the abolishing of the *Franking Privilege*, yet the proper department should bear its legitimate expense. Our lawmakers possibly are underpaid, yet there is no plausible reason why, as a partial atonement for our shortcomings in this direction, privileges should

be granted creating an erroneous impression with reference to the postal or any other specific department. Why not handle this matter as it would be handled by any private corporation or stock company, by charging the amount to sundry expense and make an annual appropriation to cover the amount and issue Franking Stamps, and thus determine where the abuse of the Franking Privilege rests, without requiring the public at large to suffer for that for which they are in no wise responsible?

In Prussia the government paid a certain amount to the Imperial Postoffice Department (Reichspost) for a franking privilege. The Postoffice Department claimed the amount paid was not sufficient to reimburse it for this privilege, and in order to prove its assertion it issued special stamps of all denominations for the use of the various official departments in Prussia.

These stamps were used only for one year, viz., from January 1st to December 31st, 1903, inclusive, and were used as a check upon the Prussian government in order to ascertain how much postage at regular rates it consumed during that period. Of course, the Franking Privilege was suspended during that year.

We are of the opinion that all engineering and technical publications are of a highly educational character, and that our rapid commercial growth is largely due to the fact there are many of these publications having correspondents throughout the civilized world whose duties primarily are to report on all industrial conditions, contracts to be awarded, contracts let, new work contemplated, etc.; thus one is constantly in touch with the world's progress, and millions of dollars' worth of business are secured annually through such advance information. Therefore, it is to be hoped nothing shall be done to interfere with this service.

AS IT AFFECTS THE ENGINEERING STUDENT.

The engineering student when leaving college and engaging in an active career along the line of his chosen profession feels the need of wise council with the experienced engineer. Text-books are digested from cover to cover, in many cases without finding that which is required. The

world is moving so rapidly that by the time a new text-book is compiled and printed, new problems to be solved have presented themselves, and these new conditions must be met. The American engineer does not know what it is to fail in his undertakings. His success is in many cases traceable to the fact that through his subscription to our leading engineering publications covering his chosen field, is being kept in touch with the brightest minds throughout the civilized world. New and novel engineering feats are accomplished almost daily. The leading publications employ able exponents of the art to write up all work of importance, and go to the expense of illustrating each article by half tones from photographic reproductions and line drawings in detail as the conditions require, and our students in every class being quick to grasp the situation and to adapt themselves to the needs of the hour have succeeded in forcing America to lead the world. Therefore, anything which may be done to hamper our education will prove a commercial calamity.

THE EFFECT ON THE INVENTIVE GENIUS.

We are largely of imaginative minds, and through our imagination we conceive ideas that are later made to create mechanical devices that revolutionize methods of accomplishing given results. An inventive genius will pick up one of our many valuable publications, and while reading of some process of manufacture conceives an idea whereby the same work may be accomplished more rapidly and accurately with a saving in time and labor expended. Therefore, our record in producing fine machine tools, and by the aid of which we are able to compete in the world's markets, primarily, no doubt, could in many instances be traced to the sowing of the seed in some imaginative mind by our periodicals. Something new is accomplished to-day at a given point and a month hence is known throughout civilization.

TO BE FOREWARNED IS TO BE FOREARMED.

Therefore, the time to act is now, and all our readers should write their respective representatives at once and express their wishes clearly and forcibly on the subject and prevent the forcing upon us of commercial suicide.

BUSINESS NOTES.

Chicago Pneumatic Company reports an unusually heavy demand for its products, and all factories are crowded to their utmost, notwithstanding the fact that a number of new automatic machines have recently been installed and which have greatly increased their output. Among the many large orders recently secured was included an order from the American Car & Foundry Co. for their new steel car plant, located at St. Louis, for 130 Boyer riveting hammers and 125 Boyer piston air drills. The demand for the product of the Chicago company is principally from concerns having used these labor saving devices for sufficient length of time to have found from tests of all makes of pneumatic tools that the product of the Chicago company are superior to all other makes on the market.

Norton Company: Mrs. Frances A. W. McIntosh, formerly advertising manager of the Standard Tool Co., Cleveland, Ohio, and more recently connected with the advertising department of Power, New York, has taken charge of the publication department of the Norton company, Worcester, Mass.

Westinghouse Machine Co. has received an order from Philadelphia Rapid Transit Co. for three additional turbine generator units each 6,000 k. w. capacity. When the order has been executed the power house in question will contain six 1,500 and ten 6,000 k. w. turbine generating units, all Westinghouse.

The power house equipment of the Rochester, Syracuse and Eastern Ry., connecting the cities of Rochester and Syracuse, can, when equipped, boast of having apparatus representing the highest development of modern electric railway machinery, the same consisting of Westinghouse-Parsons steam turbines and turbo generators, as well as switchboard and auxiliary machinery.

Through C. & A. Braniff Company, agents for The Westinghouse Electric & Mfg. Co. of Pittsburg, a large and very modern electrical plant for lighting and power, is being installed by the Oaxaca Smelting and Refining Co. The equipment

will be complete in every detail and includes a large number of individual drives. A large number of important installations throughout the mining districts of Mexico have recently been awarded the Westinghouse company.

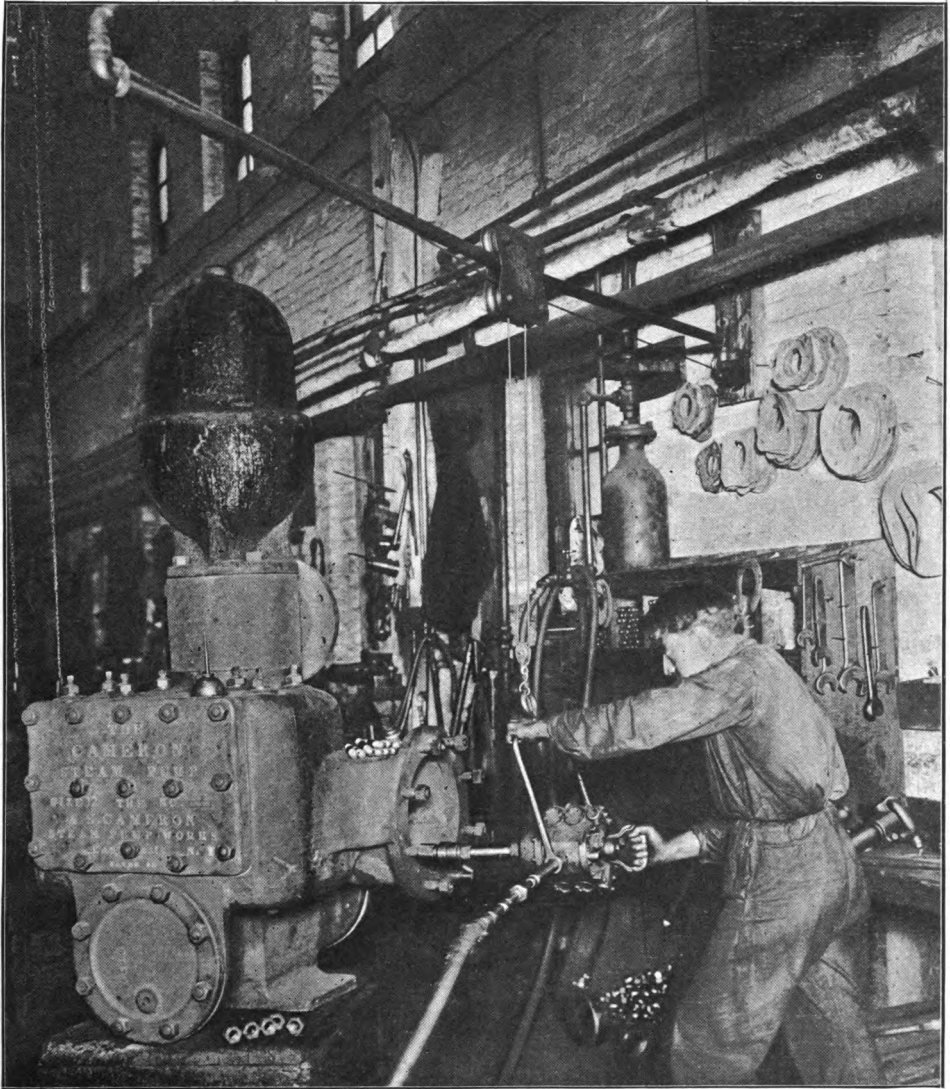
Nernst Lamp Company are publishing a miniature booklet of light literature entitled LUX, dealing with the Nernst lamp subject in attractive form. Anyone interested will receive the same by requesting the above firm at Pittsburg to place name on mailing list.

Traylor Engineering Company, New York, have recently secured many important contracts among which are listed equipments for The Tri-Bullion & Development Co. (Kelly Mines), New Mexico; The Nevada-Rockland Mining & Milling Co. of Los Angeles for their mines near Wabuska Station, Nevada; Virginia Chief Copper Mining & Smelting Co.; The Cieneguita Copper Co., with mines at Tarochi Sonora, Mexico; Giroux Consolidated Mines Co., Ely, Nevada. The Traylor Engineering Company reports business very satisfactory at all points.

**SCREWING IN CYLINDER STUDS BY
AID OF "LITTLE GIANT" AIR
DRILL IN WORKS OF THE A.
S. CAMERON STEAM
PUMP CO.**

The accompanying illustration shows a very efficient means of screwing in studs, as it is being accomplished at the A. S. Cameron Steam Pumps Works, New York City. A reversible "Little Giant" drill is used for the work, hence the arrangement is equally efficient in removing studs in case the necessity arises for so doing. The air drill is supported on a counter weighted cable suspended from a swinging jib; by this arrangement there is little or no manual labor required of the operator, hence he handles the tool rapidly changing position whenever necessary with but little loss of time.

There are many readers of IDEAL POWER who have adopted air tools to special purposes where the saving effected soon pays for the installation, yet we are sorry to say



Screwing in Cylinder Studs by Aid of Little Giant Air Drill.

there are but few who are willing to aid their fellow workmen at other points by making known to them through the various mediums of publicity as to how they are accomplishing a given class of work. This method of screwing in studs by the aid of an air drill is in use at a number of points, but we have not previously been given permission to make mention of the same.

Those familiar with the class of work mentioned will at once appreciate the saving in time and money expended in the course of a year, in a large institution such as that of the A. S. Cameron Steam Pump Works, and if the same progressive spirit prevails throughout the institution 'tis easy to understand why they stand at the head in their line of manufacture.

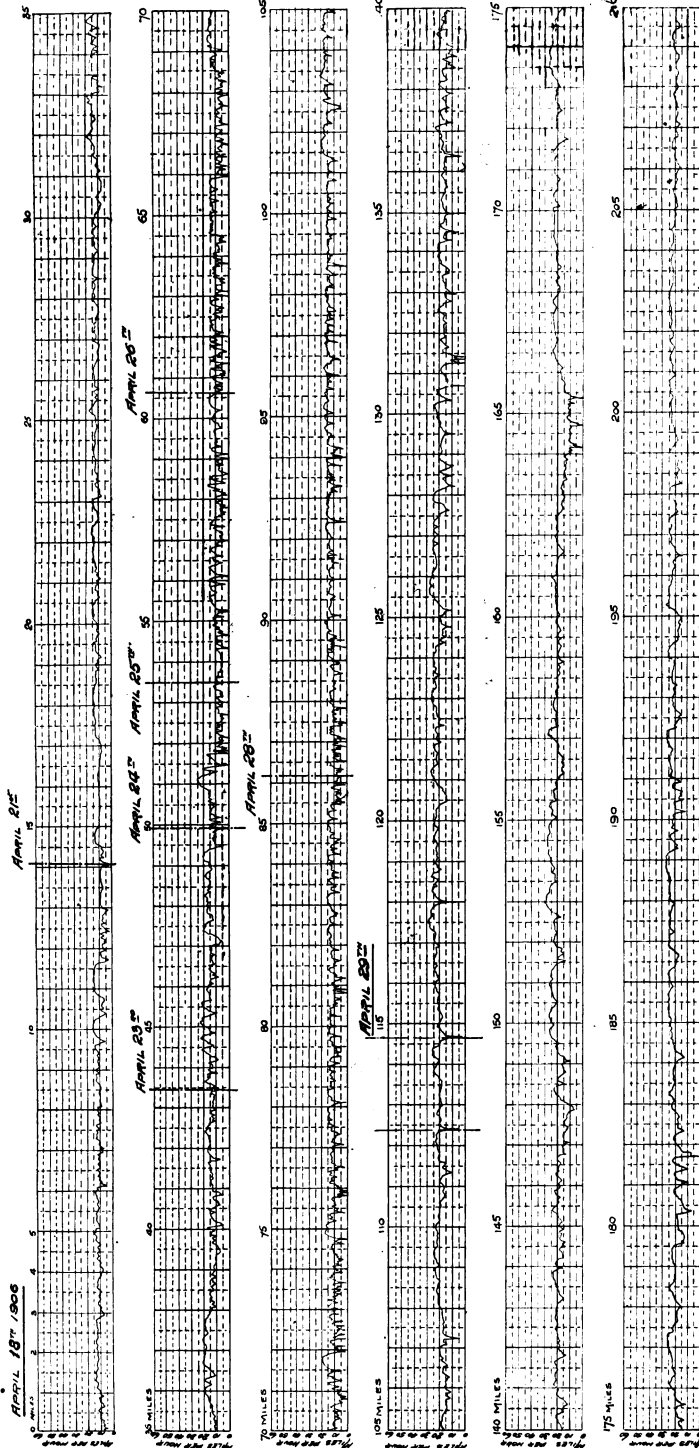


Diagram of Motor Speed Recorder

BOYER RAILWAY SPEED RECORDER ADAPTED TO AUTOMOBILE SERVICE.

The "Boyer" railway speed recorder, manufactured by the Chicago Pneumatic Tool Company, has been extensively used on a large number of American and foreign railways, with entirely satisfactory results. This recorder is so arranged that it registers the speed at all points, on tape which can be removed whenever desired, and filed for future reference.

In addition to the registering features, the recorder operates an odometer recording the number of miles made; also registers on a dial, similar to a steam gauge, which can be placed at any point desired. In connection with locomotives, the dial is usually placed in the cab, in front of the engineman, and on Pullman and private cars can be placed wherever desired. This dial shows the speed at which the train may be running, for the information of occupants of engine or car, being so constructed as to take care of the operation of the train when running either backward or forward.

In view of the fact that a great deal of agitation has arisen throughout the country, with reference to automobilists running their machines at reckless speeds, the Boyer recorder has been modified so as to adopt it to automobile service, omitting, of course, the mechanism for registering the speed when backing the machine. It is customary to place the registering gauge on the dash-board, in front of the chauffeur, so as to enable him to observe the speed at which his machine is traveling at any time, and in case any question arises as to the speed being exceeded, the recorder can be unlocked and the tape removed, which will show positively the speed at the time the car was challenged by special officer or others.

On the opposite page we reproduce a chart removed from recorder being operated on an automobile in England, which was applied to a 24-horsepower touring car. We would have been very glad to have been accorded the privilege of more fully describing the chart in question, as to its routes, etc., on which record was made,

but, inasmuch as the local speed limit of twenty miles per hour was exceeded in many instances, it has been deemed advisable not to go too deeply into these details. The portion of the chart dated April 23, 24, 25 and 26 was taken on the recorder while the car in question was being operated in London. The frequency of stops and the low speed showing the difficulties of road traffic in the metropolis. The last portion of the chart is quite interesting, owing to the fact that it shows the excellent running which can be made on the English main roads, the speed hardly varying for ten miles on end.

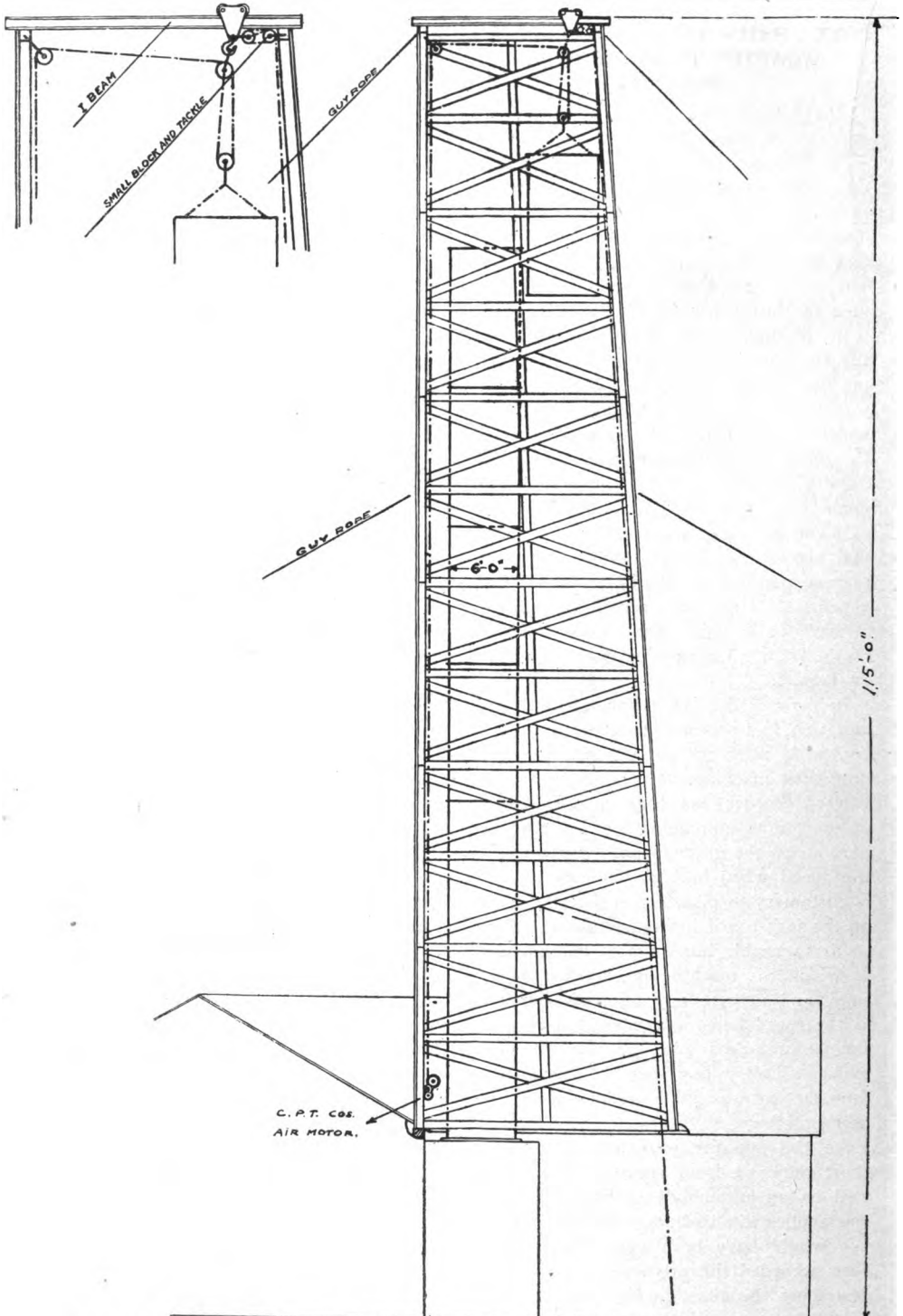
So far as we are able to determine, this is the only recorder on the market at the present time, which performs the same service as herein described.

REPLACING WORN-OUT SMOKE- STACK.

The Chicago Pneumatic Tool Company's Franklin plant recently had occasion to replace a smoke-stack which had become so badly corroded and eaten out by the sulphurous flames from the furnaces that a hammer handle could be thrust through it anywhere.

The stack in question is 6' in diameter and 100' high. The old one had been riveted up solid from bottom to top and raised in one piece, but buildings of various sizes had been constructed around it so that putting up another in its place in one piece was out of the question. It was, therefore, decided to have the stock made in sections approximately 14' in length, having angle iron rings at each end and the several sections bolted together one after the other as they were put up.

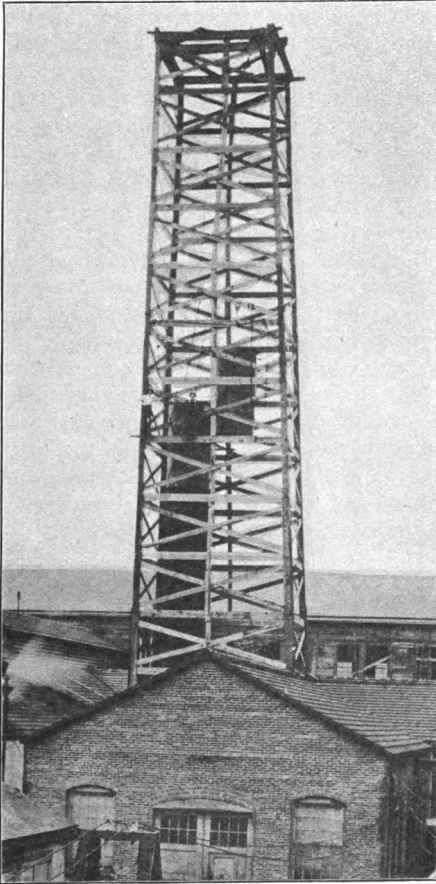
Bids were received for taking down the old stack and putting up the new one, but the figures submitted seeming exorbitant, it was finally decided that the company would erect the stack itself. The derrick, as shown in the accompanying engraving, was built of 2" x 8" planks nailed together in the form of a trough to make the corner posts, and the lattice bracing of 1" x 6" hemlock, the whole forming a light but exceedingly strong structure. The derrick was 11' 6" x 23' at the bottom and 11' 6" x



Method Adopted for Replacing Stack at Chicago Pneumatic Tool Co.'s Compressor Works at Franklin, Pa.

15' at the top, permitting of raising and lowering the sections on the inside.

An I beam was placed on top of the derrick carrying a trolley, the trolley's position on the I beam being controlled by snubbing blocks, as shown. From the trolley suspended the blocks for raising and lowering the sections. Into these blocks a



Erecting Scene.

$\frac{3}{8}$ " steel line was rove and the motive power was an ordinary windlass, operated by a Chicago Pneumatic Tool Company's air motor.

There had been some question as to whether stack could be replaced without shutting down the plant but with the rig as described, the old stack was lowered section by section, and the new one put up in just $7\frac{1}{2}$ hours on Sunday, four men

being employed on the job. The derrick, of course, having been built during the preceding week.

Practically all the lumber in the derrick was saved so that about all the expense incurred was for labor, aside from the purchase of the new stack. The total cost of the job, exclusive of the material going into the new stack, was as follows:

Erection and taking down of derrick, including the drawing of all nails	\$ 80.00
Rigging trolley tackle, I beam, etc...	15.00
Taking down old stack, putting up new one, adjusting guys, etc.....	15.00

Total\$110.00

The lower half of the stack is made of $\frac{3}{16}$ " steel and the upper half of $\frac{1}{8}$ ".

One of the accompanying photographs shows stack in course of erection, and the other shows stack completed with derrick standing.

E. N. AVANT.

Truth Is Stranger Than Fiction.

The novelist's small but valuable son had just been brought to judgment for telling a fib. His sobs having died away, he sat for a time in silent thought.

"Pa," said he, "how long will it be before I stop gittin' licked for tellin' lies, an' begin to get paid for 'em, like you do?"—Violo Gardner Brown.

Be Up and Doing!

Don't weep at your "luck," for we all must confess

Our luck is whatever we make it,
And rarely there's a man who "meets with success"—

He must chase it if he'd "overtake" it.

—Texas & Pac. Quarterly.

No Typewriter for Him.

A large firm that has recently introduced a typewriter into its correspondence department received an indignant letter from a country customer the other day, saying:

"I want you to understand that you needn't print letters sent to me. I can read writing—even yours—and I don't want to be insulted by reflections on my education."—Cassell's Journal.

THE COMMONWEALTH TRUST BUILDING, PITTSBURG,

The new building of the Commonwealth Trust Company, on Fourth avenue near Wood, is the highest office structure in Pittsburg occupying other than a corner lot. It also has the distinction of containing larger rooms than any other Pittsburg office building, the average dimensions per room in the Commonwealth building being 18 x 24 feet. It also has a larger frontage on Fourth avenue than any other building thereon, being 96 feet wide and 85 feet deep.

The building was designed by Architect F. J. Osterling, who planned the Arrott building and a number of other costly structures here and elsewhere. It is 20 stories and cost \$800,000. The site of it is the former Dallmeyer property next to the 14-story Keystone building on Fourth avenue, the Commonwealth Trust Company having bought the property in 1902 for \$434,625. The location is next to that of the 20-story building now being erected at Fourth avenue and Wood street for the Union National Bank.

GOOD LIGHTING ARRANGEMENT.

One distinctive feature of the Commonwealth building will be its large light well, which will approximate 24 x 30 feet. It will occupy the southwest corner of the lot next to the Union Bank building. By so placing it the Commonwealth building is given an unbroken front, which is an imposing one on account of the width and height of the structure.

The building is of gray granite up to the third floor and gray stone above. The interior finish will be in marble and mahogany, and the entire first floor will be occupied by the Commonwealth Trust Company, the Commonwealth Real Estate Company and the Commercial National Bank, each having separate quarters. On account of the liberal floor space the architect was enabled to evolve an excellent arrangement for the various departments and branches of the trust company, the combined departments making a most pleasing whole. Provision has been made in the bank's section for large safe deposit vaults, and in the sub-basement,

reached from the main corridor, will be a barber shop, etc.

SOME ATTRACTIVE FEATURES.

On each of the upper 19 floors there will be 15 offices, reached by a stairway and five large and high-speed elevators located in the public entrance hall next to the Keystone building. This entrance will also lead through to the Ferguson building. The other two entrances are to the Commonwealth company's offices, banking rooms, etc. Another attractive feature of the building is, that nearly every room in it will be an outside room. Owing to the largeness of the light well the few offices fronting on it have plenty of natural light, so there is not a dark room in the entire building..

When the latter was first planned the intention was to make it not over 14 stories, but it was found that to add six more stories would cost comparatively little, and would make the building as high as any on Fourth avenue. When the Commonwealth company moves into its new structure the company will have the most modern and well arranged business quarters of any trust and real estate company in the city.

This superb sky-scraper was erected by A. & S. Wilson Company; architects, Messrs. MacClure & Spahr, Pittsburg.

The erecting contractors used in connection with their work a single steam driven Franklin Air Compressor; nine No. 80 Boyer Riveting hammers and two No. 1 Class G Little Giant drills, manufactured by the Chicago Pneumatic Tool Company, Chicago.

The popularity of the Franklin Air Compressors, Boyer rivetting hammers and Little Giant drills, can more readily be appreciated from the fact that almost duplicate equipments are being used on the following buildings now under course of erection in Chicago: Fisher building addition, addition to Auditorium Annex, Otto Young building (for Carson, Pirie, Scott & Co.), addition to Marshall Field building, Cook County building, etc. There is only one building in course of erection in Chicago, at the present time on which these tools are not being used.



The 20-Story Commonwealth Trust Co. Building, Pittsburg, Pa. Erected by Aid of Franklin Air Compressor and Boyer Riveting Hammers. Erecting Contractors, A. & S. Wilson Co. Architects in Charge of Erection, Messrs. MacClure & Spahr.

FACTORS WHICH INFLUENCE THE CHARACTER OF SOUTHERN WATER POWER DEVELOPMENT.

BY JOSEPH M. ROMAN, IN ELECTRICAL WORLD.

As was pointed out in a paper read by Mr. C. E. Waddell, at the Asheville meeting of the American Institute of Electrical Engineers, July, 1905, the water powers in the south are so numerous—and some are so variable—that, to prevent reckless competition and insure continuous service at or near maximum load conditions, success for the operating company is contingent upon its controlling all of the water power which can economically supply all of the territory that its development covers.

In some instances, also, splendid water powers exist in sections easily accessible to the coal fields, so that it must be borne in mind that any water power thus located must, to be financially successful, deliver power to compete with that derived from the high grade steam coal brought in from the nearby Tennessee and Alabama coal mines. This necessitates development on a large scale, with operation and depreciation costs per unit of output reduced to a minimum, and also demands a continuous twenty-four-hour per day period of daily operation.

In considering water powers in the Southeastern Appalachian region we will first take up the important matter of fall line, which throughout this region, is well defined—the streams, with but few exceptions, falling gradually from their mountain sources to the fall line. This gradual descent, however, includes shoals at various points in the stream, where the river may fall as much as 10 feet in from one-quarter to one-half of a mile of its course. (There are instances of greater falls than this, but they are exceptions.) Shoals of from 6 to 10 feet may be one or two miles apart, where the stream flows through a ridge, and thus a succession of shoals may occur. It is evident then that high heads do not exist; that flume and penstock development as a rule has no place, and that the form of development which, with very few exceptions, will be indicated, is the building of a dam at the most favorable location

to back water over a succession of three or four shoals, possibly four to eight miles up-stream, and thus secure a head at the point of development of usually between the limits of 35 to 50 feet.

The turbine cases, which are also the penstocks, are built with horizontal shafts in the dam, near one shore, in the abutment, and discharge through draft tubes which extend under the floor of an extension of the dam. The turbine shafts in most developments are parallel to the flow of the stream, and extend through the cases and beyond the dam wall. At the point where the penstocks are installed the dam is built of heavy concrete cement and masonry—no matter how the dam proper may be constructed. At this point also a bulkhead about 10 feet higher than the remainder of the dam is erected, and the power house is constructed on an extension of this masonry portion of the dam, with the discharge tubes and tail race beneath it, and the turbine shafts extending into it, being protected from the river by the bulkhead of the dam which looms above it. The turbines in this form of development are, of course, horizontal, of the twin type, and the central line of the turbines is always about 25 feet above mean water level in the tail race. This gives an efficient use of draft tube and provides safety against the high back-water of freshets, to which all streams in this section are so liable.

The floor of the power house, which is often a portion of the dam abutment, is then constructed above tail-water at such a height that the central line of the generators, when resting on the power house floor, comes in line with the center line of the turbine shafts, to which they are direct-connected by a flange coupling. A sort of forebay is formed by blowing out the river bank; and by selecting a properly sheltered shore of the river so that wind and current tend to carry driftwood, trash, etc., to the other side, comparative freedom from this trouble is obtained.

The bulkhead then assists in forming the forebay and carries the racks, head gates and flood gates; it also serves to shelter the power house and apparatus. The floor

and a portion of two sides of the power house are abutments of the dam. While the bulkhead, as stated, is usually constructed of local rock and cement mortar, the piers and arches forming and supporting the power house and the power house itself, are constructed of concrete.

One advantage in the construction of practically all southern water powers is the fact that rock, sand and timber can be obtained in abundant quantities at the power house site; often gravel can also be there obtained.

The dam is usually constructed immediately above the location of the shoals where the development site has been selected, and by blasting the tail-race out to obtain an elevation of the bottom the same as that of the river bed below the shoals, a total head as desired is secured, and several feet in height of dam is saved, with other attendant savings. The dam itself can be constructed in various ways—long-crib and rock-filled, earth structure with masonry or concrete core-wall, reinforced concrete and rubble or cyclopean concrete. Naturally, in this, the basis of the entire development, it is impossible to secure too stable a construction, and yet, local conditions and the kilowatt capacity of the development really determine the kind of dam constructed. Thus at Morgan's Falls, Georgia (better known as "Bull Sluice"), on the Chattahoochee river, where 14,000 horsepower are developed for use in Atlanta, the dam is 48 feet in height and is constructed of rubble masonry, large stones laid in concrete, with the upstream face of rubble masonry laid in Portland cement, while the downstream face is finished in Portland cement concrete. (For further details of this development, see *Electrical World and Engineer*, XLIV, No. 27, p. 1,129.)

At Columbus, Ga., also on the Chattahoochee (where to-day a tremendous development, which will ultimately aggregate 75,000 horsepower, is contemplated), the Columbus Power Company is now developing 9,000 horsepower for municipal and manufacturing purposes. The dam is approximately 35 feet high, and is constructed in the same way—of rubble concrete ma-

sonry—with a cut-stone spillway surface. (See *Electrical World and Engineer*, XLIII, No. 4, p. 165.)

At Albany, Ga., a smaller development just completed (and which is interesting because it is in practically level country 100 miles below the "fall line") on Muckafoonee river, where the dam is approximately 20 feet high and is built of Portland cement concrete, 3,000 horsepower will be developed.

At Gainesville, on the Chattahoochee river, the first development of the North Georgia Electric Company is nearing completion and will aggregate 3,500 horsepower. The dam is a rock-filled, log-crib structure, 37 feet high, with double-planked spillway, apron and upstream face. It is approximately 300 feet long, stretching normal to the river flow. Another development of the same company on the Chestatee river, a tributary of the Chattahoochee, 15 miles from Gainesville, and which is designed to operate in parallel with the above mentioned plant, develops 1,700 horsepower, the dam being also a log-crib, rock-filled structure, 37 feet in height.

These powers, which are the most prominent ones developed in the state of Georgia, and a consideration of powers elsewhere, would indicate that for powers under 3,000 horsepower the log-crib, rock-filled dam is entirely satisfactory; for large powers a more stable form of masonry construction is essential. It should be borne in mind that the rock-filled type of dam is built of material found at the dam-site in every particular except the bolts that secure the logs together, which means a large and far-reaching economy.

The racks are supported by structural steel frames built in the abutment, and are gratings of 2-inch by $\frac{3}{8}$ -inch or thereabouts, laid on edge. The gates are immediately behind the racks, and are usually made of timbers laid crosswise, forming two courses, and work in steel grooves. They are operated by hand wheels on top of the bulkheads.

These few remarks will serve to convey a description of the type of power development which is adapted to conditions in South Carolina, Georgia and Alabama, and

practically all plants will be of the type described. It is evident that water will be backed up several miles—in many cases eight to ten miles upstream—and hence the question of ownership and riparian rights involves many people and makes securing of options slow, tedious and expensive.

There are several developments contemplated in Georgia where this method of building will be changed. At Milledgeville, on the Oconee river, and situated on the "fall line," Furman's Shoals are located, where the river drops 15 feet in 50 feet of its course. It is proposed to build a 40-foot dam above these shoals, back water for ten miles and thus secure a head of 50 feet, and drop the water on the turbines below the shoals by means of a canal and penstock. The variable nature of the river, its great width at this point and the lack of power users have retarded the development. It is stated that 6,000 to 8,000 horsepower can be developed. Another valuable development possible is on the Tallulah river in the northeastern portion of Georgia, in the foothills of the Blue Ridge. This fall takes the nature of a western development. A fall of 335 feet occurs in 4,000 feet of the river course with a mean low water flow of 720 cubic feet per second, giving a gross horsepower of over 25,000. The ownership of the entire property is as yet unsettled, and within the range of economical transmission there is no market for any considerable power; but the great future value of this power is realized and efforts of several factions are being made for its control.

BY OUR OWN STATISTICIAN

If L. G. Tooley, champion, should start lure casting with a solid rubber frog at Pokegama, Minn., and cast from there to Niagara Falls, equalling his record at each cast, it would take 28,429 8-9 casts, or 2,069 1-9 more than McKinley's plurality over Bryan in Indiana in 1900.

If each of the 187,433,634 hens in the United States (the number being arrived at by calculating one rooster to every seven hens) were to lay an egg every 4 days 13 hours and 31 minutes, and if all the eggs were to be made into an omelet, the omelet would be 24,991,151,200 inches long, 14,994,-

690,720 inches wide, and 74,873,145,360 inches thick. If the hens' eggs were all ostrich eggs the omelet would be 8,330,383,733 yards and one foot long, 4,998,230,240 yards wide, and 2,776,794,577 yards and 2 feet thick.

If the 118,765,680 pigs' feet pickled in the United States in 1905 paid the import duty of \$1.78 charged on salted and pickled pork in Seychelles, and if that duty should be divided by 138,322,481,114,881, it would equal exactly the number of hundred-weights of areca nuts exported from Ceylon in 1905.

If there are 86,432,291 persons in the United States, and if 2,746 of them are worth over \$1,000,000 each, and if all the bills introduced during the recent sessions of congress had become laws, there would have been a new law for every 1,546 persons in the United States, calculating on the basis that no law applies to any man worth over \$1,000,000.

If all the time wasted by farmers of the United States sitting on rail fences and discussing the weather were used in plowing the yield of corn per acre would be increased one-third of 1 per cent per acre, which would make the total crop 98,437,564,934 bushels. The acreage would be increased at the same ration, minus three and three-quarters extra, the calculation being based on the fact that Charley Swartz of Mercer County, Ohio, never could be cured. The total acreage then would be 92,539,015 92-100.

If all the vermiform appendices cut out of all the appendicitis patients in the United States in the last five years were to be made into one appendix, that appendix would be 1,467,621 inches long and 244,603 1-3 inches in diameter. The surgeons' fee would be \$220,143,150, of which \$116,239,415.50 would be paid.

If all the words in the English language, exclusive of slang, were to be set into 12 point Cheltenham italic caps, and if then the letters were to be pulled out straight, they would make a straight line long enough to extend from Stuttgart to Wiju Corea and back to a point three miles west of Ystradyfodwg, with a two mile siding at each end.

THE INDIVIDUAL EFFORT AND PIECE-WORK SYSTEMS.

Much has been written and said of late concerning the comparative merits of the individual effort or bonus system and the piece-work system of operating railroad shops, and a brief review of the points for and against each system may be opportune.

Under the individual effort system a standard time is set for doing each piece of work, based on a record, kept to fractions of a minute, of the time required by a competent workman to do the same. In this and many other particulars it agrees closely with piece-work, but it differs essentially in two features: (1) It guarantees to each man his day rate of pay, even though he may do less than the standard amount of work; and (2) for each succeeding piece done in excess of the standard day's work the price per piece is increased by arithmetical progression, which offers an extra inducement for a man to increase his output up to the very limit of his capacity. A clear idea of the working of the individual effort and piece-work systems as compared with day-work, can best be given by illustrating with an example in which we will take a man whose day rate is 20 cents an hour, engaged in planing driving box wedges, for which the piece-work or individual effort price has been fixed at 20 cents each. The man's earnings and the cost of the work under the various systems will be as follows:

	—Day work—		—Piece work—		Individual effort system—	
	Cost, total.	Cost, per piece.	Cost, total.	Cost, per piece.	Cost, total.	Cost, per piece.
6 wedges	\$2.00	\$0.333	\$1.20	\$0.20	\$2.00	\$0.333
8 wedges	2.00	.25	1.60	.20	2.00	.250
10 wedges	2.00	.20	2.00	.20	2.00	.200
11 wedges .....	...	...	2.20	.20	2.225	.202
12 wedges .....	...	...	2.40	.20	2.475	.206
13 wedges .....	...	...	2.60	.20	2.750	.212
14 wedges .....	...	...	2.80	.20	3.050	.218
15 wedges .....	...	...	3.00	.20	3.375	.225
16 wedges .....	...	...	3.20	.20	3.725	.233

In this example the day-work cost has not been extended beyond \$2, because the price under the piece-work and individual effort systems has been based on an output which is slightly greater than the average obtained by day-work.

A prominent exponent of the individual effort system, writing in an engineering

journal recently, itemized the good points of this system as follows:

1. "The standard time set is reasonable and one that can be reached without extraordinary effort; is, in fact, such time as a good foreman would demand.

2. "An extra reward of one-fifth of the regular wages for the operation is given to whoever makes standard time.

3. "Extra compensation above the hourly rate is paid, even if standard time is not reached, although this extra compensation diminishes in percentage above standard time and a half.

4. "If longer than time and a half is taken, the regular day-rate is paid. Of this, the wage-earner is also sure.

5. "Standard time is carefully determined by observation and experiment, and is only changed when conditions change.

6. "The arrangement is one of mutual benefit to both parties—of increased earning to the worker, of increased saving to the employer.

7. "The employer loses more than the wage-earner if schedules do not encourage co-operation.

8. "The wage-earner working on a schedule becomes in a large degree his own foreman.

9. "The wage-earner determines his own earning power, and by co-operating to cut out wastes increases his own value."

Now, let us see to what extent these

same claims apply to modern piece-work, and in so doing it should be borne in mind that the up-to-date piece-work practice of the present day is quite different from that of twenty, or even five, years ago.

1. The present method of making piece-work prices is practically identical with that described for setting the "standard

time" for a job under the individual effort system.

2. The piece worker also obtains extra pay for increased efforts.

3. This differs from the piece-work practice under which no extra compensation is paid until the work is turned out in what may be considered as standard time.

4. Here again piece-work differs, in that a man is paid for the actual amount of work performed, and if this does not come up to the average, his earnings will drop below his day rate.

5. If we use the word "price" instead of "time," this statement applies with equal force to piece-work.

6. This claim applies with equal force to piece-work.

7. In this respect piece-work differs because it is equally advantageous for the employer and the wage-earner to have the schedules fair and equitable to both.

8 and 9. These claims are also equally true of piece-work.

Advocates of the individual effort system admit that "nothing compels the employe to make standard time," which may be understood to mean that it permits the lazy and incompetent workmen to hold on to their job indefinitely, whereas such men soon voluntarily leave a piece-work shop. The matter of making prices and keeping a record of the earnings is somewhat more complicated under the individual effort system than under the piece-work system. Either of these systems will mean for the employer better men, better work and more of it, and for the employe they will mean better pay and, as a rule, steadier work than under the day-work system. A comparison of the payrolls of day-work with piece-work and individual effort shops will show that the average earnings for the two latter are between 15 and 40 per cent higher per hour than for the day-work shops, which is a practical refutation of the claim commonly made by opponents of piece-work that it is a scheme for reducing wages.

Some of the claims made by advocates of piece-work in favor of their system as compared with the individual effort system are that supervision costs less in proportion

to output; that it is simpler and more easily comprehended by the workmen, and is less expensive to install and check up. We see no grounds for advocates of either system claiming any advantage over the other in the matter of stimulating ingenuity and head-work on the part of the workmen; and, in fact, the term "individual effort" is as accurately descriptive of the modern piece-work system as it is of the "premium system" by which it has been appropriated.

To sum up, the two systems agree in most of their essential features; both are beneficial and absolutely fair to the employe, and at the same time advantageous to the employer; but the guaranteed day rate and more euphonious name may make the individual effort system more attractive and therefore easier to introduce in shops which have hitherto been run exclusively on a day-work basis.—*Railroad Gazette*.

A Mingling of Emblems.

"Somebody says that our national plant ought to be the mint."

"That's so. With the mint for our national plant and the big stick for our national emblem, we ought to be able to get a little spirit in our international affairs."—*Baltimore American*.

Too Puzzling.

"So you don't care for Boston girls?" interrogated the windmill drummer.

"No, by heck," drawled old Farmer Hardapple. "They put on too many frills with their words. For instance, my niece came from Boston and one day she told me to 'occlude' the door. By the time I got the dictionary out of the garret and found out what 'occlude' meant, the drafts had given the old woman the neuralgia, started up grandpa's rheumatism and laid up all the children with the whooping cough. No, mister, I don't believe in unnecessary words."—*Daily News, Chicago*.

It's the man who never does anything who is always Johnny-on-the-spot when it comes to telling how things should be done.



Fame is delightful, but as collateral it does not rank high.

To know when to be generous and when firm—that is wisdom.

Be moderate in the use of everything except fresh air and sunshine.

Self-reliance, self-control and self-respect are the three things that make a man a man.

Occasionally a man spends a lot of time at his club because there's no place like home.

If Adam had eaten the apple first he would probably have declared that Eve dared him to.

Don't worry over trifles. If you must worry, pick out something worth while. then get busy.

Art follows in the wake of commerce, for without commerce there is neither surplus wealth nor leisure.

A woman seldom listens to a man's explanation, yet it makes her angry if he refuses to offer one.

It is the unfailing law of trade and of nature that nothing is ever given away, you pay for everything you get.

The genuine joys of life are to be gotten from useful effort, and to hunt for pleasure is to lose it. Do your work and pleasure will come to you.

An Ohio man recently made a strenuous effort to drown his sorrow by pushing his mother-in-law into the river.

No man gets along in life without the co-operation and support of other men, independence is out of the question.

Joy leads to every physical and mental good—sorrow is pathological. There is no medicine equal to a merry laugh.

By accepting life as it is, we take the bitterness out of it, and this play of life then ends beautifully as every play should.

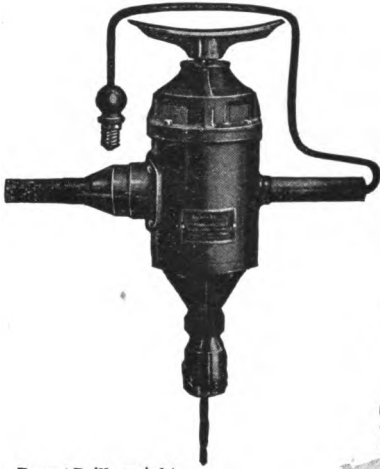
Great people are teachers through necessity, for it is only in explaining a matter to another that we make it clear to ourselves.

The average man thinks he would have an excellent chance of occupying the presidential chair if the office sought the man.

The ulster of virtue, put on and buttoned under the chin as an expedient move in times of social and political danger, is garment still in vogue.

If a girl can pass the thirtieth anniversary of her birth without being detected she begins to look upon the family record as ancient history.—Daily News, Chicago.

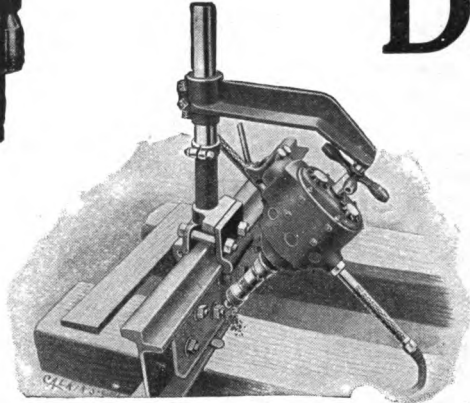
The enlightened man tries to bring about heaven here and now, and by that effort he reaches heaven. The man hard at work in a good cause is right in the suburbs of paradise.



Breast Drill, weight
13 lbs.
Capacity, $\frac{3}{8}$ in.
In iron or steel.

Sent
on
Trial
Anywhere

Duntley Electric Drills



Two-Motor Type in operation, drilling for Amalgam Bonds.
Magnetic oil-man supplied when desired.

Are
Strong
Durable
Efficient

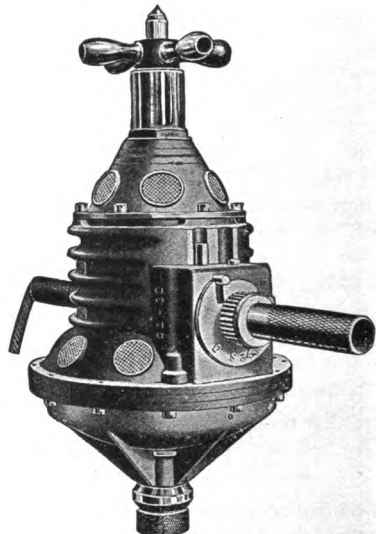
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550 Volts Direct Current

WRITE FOR CATALOGUE AND PRICES

**Chicago
Pneumatic
Tool Company**

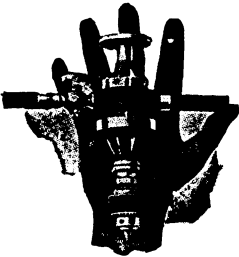
CHICAGO—NEW YORK

Manufacturers Air Compressors, Pneumatic
Tools, Hoists Electric Drills, Etc.



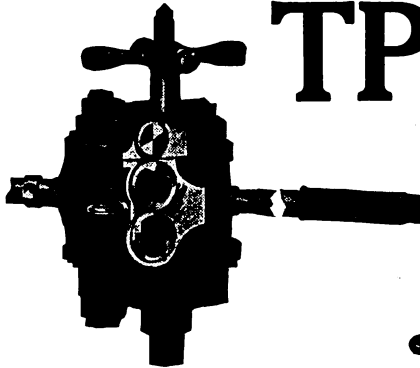
Single Motor Type, weights ranging from
35 to 52 lbs. Capacities $\frac{1}{8}$ in. to $1\frac{1}{2}$ in.

AIR DRILLS ROTARY and PISTON TPYES



**Chicago Midget
Rotary Drill**

The smallest Air
Drill ever made.
Weight $2\frac{1}{2}$ pounds.
Motor Speed
22,000. Spindle
Speed 2,000. Cap-
acity $\frac{3}{8}$ ins. in steel.



**No. 1
LITTLE GIANT**

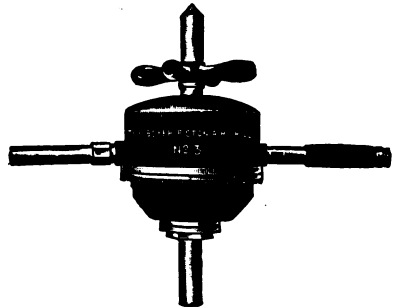
Our product is
the measurement
of standard every-
where.

If in doubt make a test, as to endurance-
economical air consumption and maintenance
as to work accomplished.

Sent On Trial.

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"Little Giant" Piston
Drills are made in 13
sizes, with plain or
Corliss valves.



**Boyer Piston Drills, made in 2 sizes.
The ideal air drills for reaming.**

Chicago Pneumatic Tool Company

C H I C A G O N E W Y O R K

Manufacturers, Air Compressors, Pneumatic Tools, Hoists, Electric Drills, Etc.

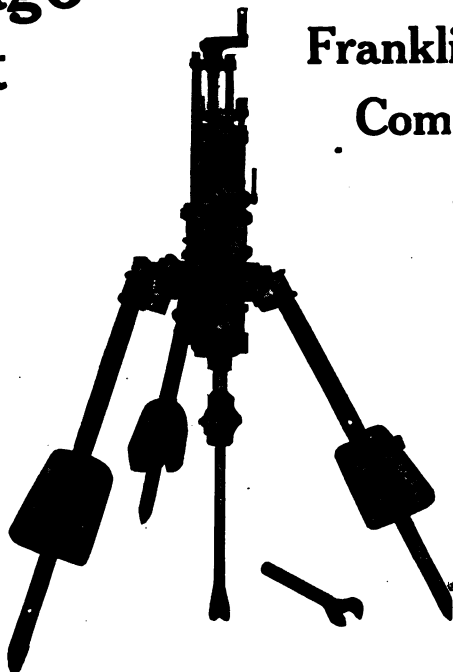
CHICAGO PNEUMATIC TOOL CO.

CHICAGO :: NEW YORK

MANUFACTURERS OF

"Chicago"
Giant
Rock
Drills

Pneumatic Tools
Franklin Air
Compressors,
Etc.



Tools
Sent
On
Trial

Write for
Catalogue
and
Prices

WESTERN REPRESENTATIVES

Morse Bros. Machinery & Supply Co., Denver, Colorado
Western Mining Supply Company, Butte, Montana
Salt Lake Hardware Company, Salt Lake City, Utah
Eccles & Smith Company, San Francisco, Cal., Portland, Oregon
Machinery & Electrical Company, Los Angeles, California
Hallide Machinery Company, Seattle, Washington

NECESSITIES

High Grade Rubber Goods

Fire Hose

Reels, Nozzles

Fire Hose Carts

Rubber Cement

P. & W. Rubber Preservative

Rubber Boots

Leather Soled Rubber Boots

Leather Belting

Upholsterer's Leather

Leather and Silk Fringes

Vestibule Diaphragms

Gimp

Brass Nails

Leather Head Nails

Signal Flags

Bunting

Lineoleum

Cab Cushions

Cab Curtains

Track Jacks

Economy Soap Stock

Nut Locks

G. S. WOOD, 209 Great Northern Bldg., Chicago, Ill.

NOTHIN' from NOTHIN' LEAVES YOU

BUT When Your Cuts For All Advertising Purposes Are Made By

TIM E. CALKINS

ENGRAVER AND ILLUSTRATOR

115 Dearborn St., Chicago, Ill.

THERE IS

SOMETHIN' for SOMETHIN' for TIM and YOU

WHEN YOU
Order PRINTING Know

THAT IT WILL BE

ENGINEERED

WITH SKILL

The Caslon Press

ENGINEERS OF PRINTING

Cards : Letterheads : Circulars : Catalogues

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CHICAGO

NECESSITIES

High Grade Rubber Goods
Fire Hose
Reels, Nozzles
Fire Hose Carts
Rubber Cement
P. & W. Rubber Preservative
Rubber Boots
Leather Soled Rubber Boots

Leather Belting
Upholsterer's Leather
Leather and Silk Fringes
Vestibule Diaphragms
Gimp
Brass Nails
Leather Head Nails

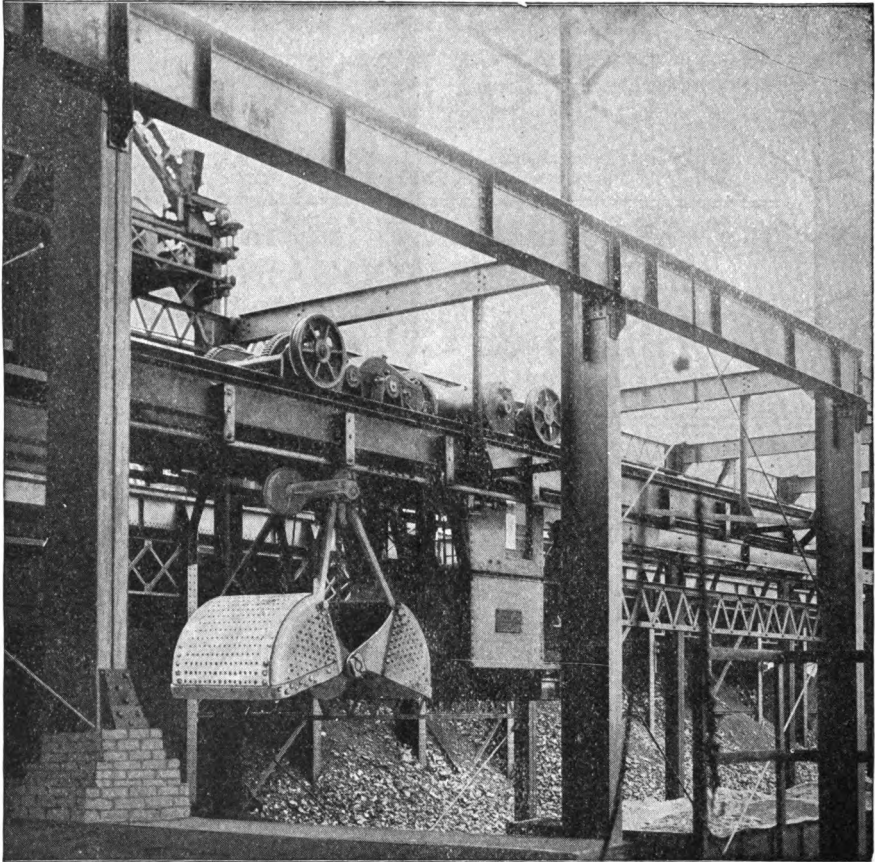
Signal Flags
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Lineoleum
Cab Cushions
Cab Curtains
Track Jacks
Economy Soap Stock
Nut Locks

G. S. WOOD, 209 Great Northern Bldg., Chicago, Ill.

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Let Us Show You How We Can Do It For 1 Cent a Ton



**Our Bucket Trolley Can Handle Coal and Ashes at Power Plants
Cheaper Than Any Other Method**

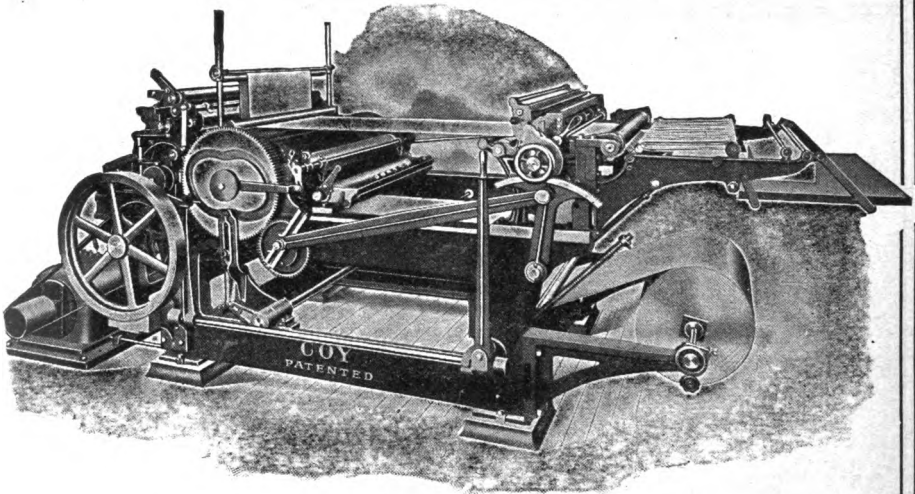
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BROWNING ENGINEERING CO.
CLEVELAND, OHIO

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THE COY ROTARY

Two Color and Perfecting JOB PRESS



¶ Meets the demand of the printer having long and regular runs in a manner not done by any other press on the market.

¶ Delivers sheets of any size, scored, perforated, punched or numbered as desired, or it will rewind.

¶ Prints two colors on one side, or one color on both sides.

¶ Especially adapted to general job work, and many special purposes.

¶ Let us know your requirements and we can meet them.

MANUFACTURED BY

THE COY PRINTING PRESS CO.
59 PLYMOUTH PLACE, CHICAGO

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CONVENTION DATES.

March 19-21, 1907—American Railway Engineering and Maintenance of Way Association. Auditorium Hotel, Chicago, Ill.

April 9, 1907—Air Brake Association, Columbus, Ohio.

May, 1907—International Railway General Foreman's Association, Chicago, Ill. (Date later.)

May 20-22, 1907—Railway Storekeepers Association, Chicago, Ill.

May 21-22, 1907—Master Steam Boiler Makers' Association and International Railway Master Steam Boiler Makers' Association will meet in joint convention at the Hotel Hollenden, Cleveland, Ohio.

June 4-7, 1907—National Electric Light Association—New Willard Hotel, Washington, D. C.

June 10, 1907—American Order of Steam Engineers, Atlantic City.

June 12-14, 1907—American Railway Master Mechanics' Association, Atlantic City.

June 17-19, 1907—Master Car Builders' Association, Atlantic City.

June 19, 1907—Association of Railway Telegraph Superintendents, Atlantic City, N. J.

June 25, 1907—American Institute of Electrical Engineers, Niagara Falls, N. Y.

Aug. 20, 1907—International Railroad Master Blacksmiths' Association, Montreal, Que., Canada.

Sept. 10-13, 1907—Master Car and Locomotive Painters' Association of the U. S. and Canada, Rading, Mass.

Sept. 10-20, 1907—National Association of Stationary Engineers, Niagara Falls, N. Y.

Sept. 1907—Traveling Engineers Association, Chicago. (Date of month later.)

Oct. 8-10, 1907—Railway Signal Association, Milwaukee, Wis.

Oct. 15-17, 1907—Association of Railway Superintendents of Bridges and Buildings, Salt Lake City, Utah.

Oct. 1907—American Street and Interurban Railway Association. (Place and date later.)

Oct. 1907—American Street and Interurban Railway Engineering Association. (Place and date later.)

Oct. 1907—American Street and Interurban Railway Manufacturers' Association. (Place and date later.)

Nov., 1907—Roadmasters and Maintenance of Way Association. (Plate and date later.)

Nov., 1907—Association of Maintenance of Way Master Painters (U. S. and Canada), Chicago. (Date of month later.)

1907—American Boiler Manufacturers' Association, Atlanta, Ga. (Date later.)

1907—Railway Storekeepers' Association. (Place and date later.)

1907—Road and Track Supply Association. (Place and date later.)

Sept., 2d Monday, 1908—International Union of Steam Engineers, Philadelphia, Pa.

ENGINEERING SOCIETIES, ETC

American Institute of Electrical Engineers—President, Samuel Sheldon, Brooklyn, N. Y.; Secretary, Ralph W. Pope, 33 W. 39th St., Engineers' Building, New York, N. Y.

American Institute of Mining Engineers—President, James Gayley, 71 Broadway, New York; Secretary, R. W. Raymond, 99 John St., New York.

American Society of Civil Engineers—President, Frederic P. Stearns, 1 Ashburton Pl., Boston; Secretary, Charles Warren Hunt, 220 W. 57th St., New York.

American Society of Mechanical Engineers—President, Fred W. Taylor, Philadelphia, Pa.; Secretary, F. R. Hutton, 12 W. 31st St., New York.

American Society of Heating and Ventilating Engineers—President, Andrew Harvey, 28 First St., Detroit, Mich.; Secretary, W. M. Mackay, 235 Water St., New York.

American Society of Naval Engineers—President, W. M. Parks, Navy Dept., Washington, D. C.; Secretary, Theo. C. Fenton, Navy Dept., Washington, D. C.

American Society of Refrigerating Engineers—President, W. E. Parsons, 12 Bridge St., New York; Secretary, Wm. H. Ross, A-9 Produce Exchange Annex, New York.

Association of Civil Engineers, Cornell University—President, C. F. Cook, 24 Grove Place, Utica, N. Y.; Secretary, C. L. Crandall, care Cornell Univ., Ithaca, N. Y.

Association of Engineering Societies—Fred Brooks, Secretary, 31 Milk St., Boston, Mass.

Boston Society of Civil Engineers—President, Frank W. Hodgdon, 131 State House, Boston; Secretary, S. Everett Tinkham, 60 City Hall, Boston.

Brooklyn Engineers' Club—President, Richard S. Buck, Park Row Bldg., New York; Secretary, Joseph Strachan, 197 Montague St., Brooklyn.

Canadian Society of Civil Engineers—President, Ernest Marceau, 1709 Notre Dame St., Montreal; Secretary, Clement H. McLeod, 877 Dorchester St., Montreal.

Civil Engineers' Club of Cleveland—President, Dayton C. Miller, Cleveland, Ohio; Secretary, Joe C. Beardsley, 1200 Schofield Bldg., Cleveland.

Civil Engineers' Society of St. Paul—President, A. R. Starkey, Asst. Comm. of Public Works, St. Paul; Secretary, C. L. Annan, Dept. of Public Works, St. Paul.

Connecticut Society of Civil Engineers—President, Charles F. Chase, New Britain, Conn.; Secretary, J. Frederick Jackson, New Haven, Conn.

Detroit Engineering Society—President, Benjamin Douglas, care M. C. R. R., Detroit, Mich.; Secretary, Clarence W. Hubbell, care Water Office, Detroit.

Engineering Association of the South (1904)—President, Geo. M. Ingram, Nashville, Tenn.; Secretary, Howard M. Jones, care N. C. & St. L. Ry., Nashville.

Engineers' Club of Cincinnati (1901)—President, L. E. Bogen, Norwood, Ohio; Secretary.

Engineers' Club of Minneapolis—President, James B. Gilman, Minneapolis, Minn.; Secretary, O. P. Bailey, 936 Lumber Exchange, Minneapolis.

Engineers' Club of Philadelphia—President, Thomas C. McBride, 724 Arch St., Philadelphia, Pa.; Secretary, Walter Loring Webb, 2222 Land Title Bldg., Philadelphia.

Engineers' Club of St. Louis—President, W. A. Layman, 2017 Locust St., St. Louis, Mo.; Secretary, R. H. Fernald, 3817 Olive St., St. Louis, Mo.

Engineers' Society of Western New York—President, Louis H. Knapp, 366 Ellicott Square, Buffalo; Secretary, Thos. J. Rogers, Municipal Bldg., Buffalo.

Engineers' Society of Western Pennsylvania—President, Julian Kennedy, 5400 Forbes St., Pittsburg; Secretary, F. V. McMullin, 803 Fulton Bldg., Pittsburg.

Illinois Society of Engineers and Surveyors—President, Dabney H. Maury, Peoria, Ill.; Secretary, E. E. R. Tratman, 1636 Monadnock Block, Chicago.

Illuminating Engineering Society—President, L. B. Marks, 220 Broadway, New York; Secretary, A. H. Elliott, 4 Irving Place, New York.

Indiana Engineering Society—President, R. L. Sackett, Richmond, Ind.; Secretary, Charles C. Brown, Indianapolis, Ind.

Indianapolis Engineers' Club—Indianapolis, Ind.

Iowa Engineering Society—President, Seth Dean, Glenwood, Iowa; Secretary, C. L. Bryden, Iowa City, Iowa.

Louisiana Engineering Society—President,

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The Improved Sectional Beading Expander

The strongest and best expander made; operated by hand,
No. 80 Boyer Riveting Hammer or Jam Riveter

Our Roller Expanders

are the simplest and best. We make seven different patterns. Both hand and self feeding.



Sent Anywhere on Trial

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J. FAESSLER MFG. Co., Moberly, Mo.

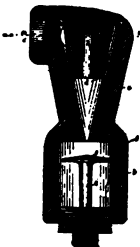


Andrews' Office Furniture

is the best and costs no more than the ordinary kind.

The A. H. Andrews Co.
174 Wabash Ave.

KEEP OUT THE DIRT



DERBY DUST COLLECTORS
used at the outlets of compressed air pipe lines, keeps the dirt, pipe rust and moisture from getting into pneumatic tools.

No Screens to Stop Up
WRITE for CIRCULAR
Derby Manufacturing Co.
Burlington, Iowa

CHICAGO, ILL.
49 W. DIVISION ST.

SEND FOR CIRCULARS

CONDENSERS
AND SYPHONS
SURFACE
SEPARATORS
OIL and STEAM

PLAIN TUBULAR HEATER
E.T.O.

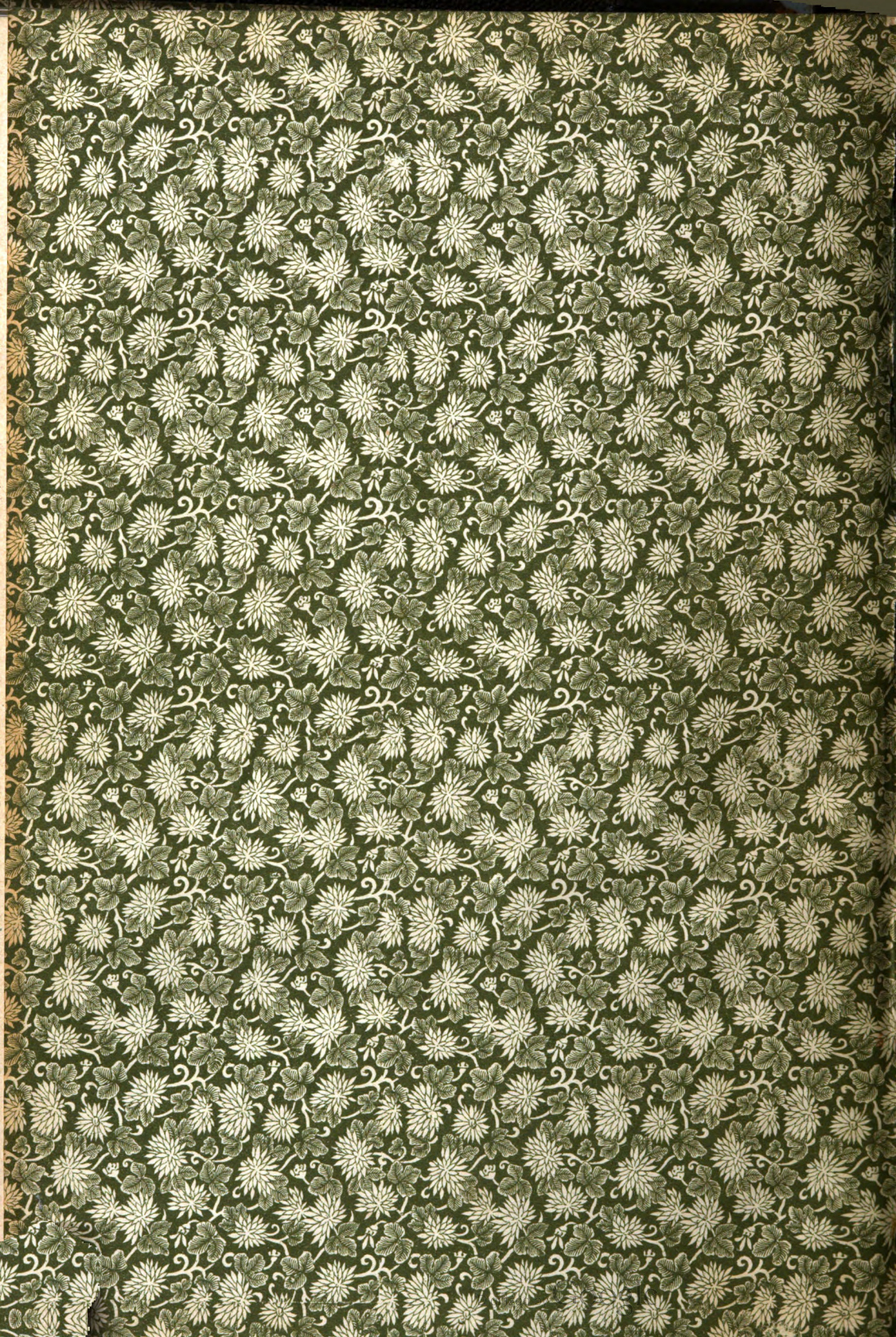
SYPHON CONDENSER
E.T.O.

STEAM JACKET HEATER

FEED WATER
LIVE STEAM
Purifiers
PRESSURE AND OPEN
HEATERS

FEED WATER
MANUFACTURED BY
W. M. BARAGWANATH & SON

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